

of the paragraph had communicated with myself previously to "rushing into print," he would have received such information as would have prevented him giving publicity to a statement which however literally correct, is erroneous in essence.

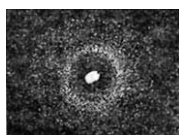
EDWARD HULL,
Director of the Geological Survey
of Ireland

Geological Survey of Ireland, Dublin, November 6

[We were indebted for the note to the courtesy of Mr. Kinahan, of the Geological Survey of Ireland.—ED.]

Lunar Ring

WHILE experimenting on the actinic power of lunar light on August 30 last (period of full moon), at 9.30 P.M., I obtained, with a minute-and-a-half exposure, a photographic negative of the moon, which shows a distinct and well-defined ring or glory around it which was not visible to the naked eye on looking directly at the moon in a clear and cloudless sky, nor was there any halo on the ground glass of the camera, nor on the lens, at the time of observation. This is a copy of it from the negative.



I used no clock-work arrangement with the camera, but allowed the moon to traverse the plate, and I have since then taken several photographic observations under various conditions. I have taken the moon in all her phases, with long and short exposures, in clear and cloudless sky, and never could get a ring even faintly defined. I have also heated the camera and screwed the cold lens into it, carried it into a colder atmosphere in order to produce condensation of dew. I have placed two small separate openings in front of the lens; on one occasion I dusted puff-ball spores upon the lens; on another I breathed warm breath upon it, but never got anything but decided burr, which was always densest near the limb of the moon and gradually tapered away towards the circumference like a bright light seen through a thick fog, but no appearance of ring. I have also taken observations when scud was passing rapidly over the moon, when perfect prismatic halos were visible to the naked eye, but no ring was ever impressed on the photographs; nothing more than a haze, such as that produced by breathing on the lens. The next full moon (September 29) was totally obscured, so that I failed to get an observation then; but last evening (October 29), at 10 P.M., I was fortunate to get one fine, clear exposure of one-and-a-half minute, and was pleased to see a clear and well-defined ring rise up on the plate during development, similar in every respect to that obtained on August 29, showing clearly that this unusual appearance is dependent upon the position of the moon in her orbit, she being in opposition when she manifests ring-giving power and shows us a crown. But why is this? What is the cause of this unusual, and, I believe, hitherto undescribed, appearance? Why should this ring be invisible to the naked eye and yet give a luminous impression on a photographic plate? Why should it appear only at full moon period and not at any other phase? Can it have any connection with what Mr. Newall saw round Mars through his huge telescope? If the moon had an atmosphere similar to that of the earth, and a star of some magnitude were occulted by the moon at that particular time, it is possible that its light in passing through the lunar atmosphere might be refracted so as to show a corona round the moon; but it is pretty generally acknowledged that there is no atmosphere surrounding it, therefore there can be no refraction.

It might be that the solar rays in passing through the upper regions of the earth's atmosphere are so deflected that the ultra-violet rays (though invisible) are thus rendered visible.

It is also possible that the doubly-reflected lunar light (the ashy light), in passing back to the moon from the earth, encounters on its passage the reflected solar rays from the moon, arresting and nullifying in proportion to its strength, so much of the light proceeding from the moon thereby causing a clear space around the moon-limb, a region of inertia, while the reflection from the disk of the earth, being larger than the moon's reflecting disk, will show itself as a ring on the outer edge of

the neutral zone, much in the same manner as two heliographic reflectors would act if they were so arranged as to throw their respective reflections directly into and upon each other, the one being small and the other larger, just as the moon is the smaller and the earth the larger body, the smaller body reflecting a smaller, brighter light, while the larger body would reflect from its broader disk a less brilliant light with a feebler force, yet not so feeble as to prevent it arresting an amount of force equal to itself.

GEORGE BERWICK

Sunderland, October 30

[Dr. Berwick's explanation appears scarcely sound for it involves the assumption that a ray of light meeting another can arrest it; and also it involves the visibility of such rays while traversing space. We would remark that faint halos due to atmospheric causes are often seen almost masked by the brightness of a full moon, and the photograph being over-exposed, so far as the moon is concerned, does not show the relative actinic brightness of moon and halo. Would Dr. Berwick try further experiments with shorter exposures, and also ascertain from a number of photographs how far on either side of full moon a halo can be photographed, and whether it is always present during similar periods?—ED.]

Phosphorescence

A FEW days ago my attention was drawn to the phosphorescence of some fish (haddock) just received from the coast. The light was most brilliant about the fins and inside of the fish, which had been gutted. A spectroscope of low dispersive power showed all the light to belong to the green part of the spectrum. Approximate measures gave 557.5 (mm.) and 458.4 as the extreme wavelengths, the part from 557.5 to 503.4 being somewhat brighter than the remainder, with a feebly indicated maximum at 527.6.

In the hope of getting a brighter spectrum the fish were washed in as small a quantity of water as possible. This water became highly phosphorescent, and when agitated in a bowl, gave beautiful luminous caustics, but neither in the bowl nor in a glass trough, nor in a tube of half-inch bore, did the liquid give a brighter spectrum than that afforded by the fish.

A large bubble of air was inclosed with the liquid in the tube. When the tube was violently agitated, it became luminous from end to end; if then held vertically, the light rapidly faded except near the top of the liquid, but on suddenly inverting the tube, the bubble of air slowly ascended, causing the whole contents of the tube to phosphoresce very brilliantly. This was a most striking phenomenon. After the lapse of some nine hours, the liquid had almost entirely lost the power of giving light.

The Observatory, Duncricht, Aberdeen, November 5

RALPH COPELAND

The "False Dawn"

FOR some time past certain considerations had led me gradually to infer that the "False Dawn" of the very extensive literature of Islām, whether Arabic, Persian, or Turkish, &c., and whether prose or verse, is another name for the "Zodiacal Light." No dictionary yet published so explains it.

I submitted my ideas and reasons to a number of English and foreign astronomers and linguists. All expressed their concurrence in those views; but direct proof of their correctness was not at once forthcoming. Recently, however, through the kindness of the Hydrographer to the Admiralty, a most obliging effort was made to solve this question by Capt. Wharton, commanding H.M.S. *Fawn*, now cruising in the Sea of Marmora. The method employed by that officer, and its conclusive result, cannot be better described than by giving his own words as follows:—

H.M.S. *Fawn*, Tuzla Bay,
September 26, 1879

Dear Capt. Evans,

For the information of Mr. Redhouse, I have to tell you that I can satisfactorily answer his question as to the false dawn of the Turks.

On the morning of the 20th instant, at 3.30 A.M., I went to a mosque at Buyukdere, and interviewed the Imaum, who, on being asked for the "fejri kyazib,"¹ at once pointed out the zodiacal light, then brightly shining in the east. . . . There can be no doubt as to the coincidence of the two.

Yours sincerely,

W. J. L. WHARTON

¹ "Fejri Kyazib" is the Arabic expression for "the false dawn."

This preliminary philological question being thus irrefragably settled, I wish to bring to the knowledge of English and western astronomers the fact that, though the zodiacal light was first distinctly noticed in England in 1661, and named in France by Cassini, in about 1683, the "false dawn" was known to the Arabians in the days of Muhammad, who is said by the commentators in the 183rd verse of Chap. II. of the Qur'an, to have there legislated on the subject as follows, when he instituted the diurnal fast of the Ramazan in the second year of the Hijra (A.D. 624) :

"And eat and drink until the lighter streak of the dawn shall become distinguishable unto you from the darker streak."

Commentators, and, after them, the most highly esteemed Arabic dictionary, the *Sihāh* of Jawhari, who died in A. H. 397 (A.D. 1006) explains the expression "the lighter streak," as meaning "the true dawn," and, "the darker streak" as signifying "the false dawn."

Here, then, is incontrovertible proof that the zodiacal light, under its Arabic name of "the false dawn" was explicitly mentioned 650 years, and implicitly, 1,000 and odd years, before western observers had noticed the phenomenon. This is a point deserving special consideration by all who may in future write a history of the progress of discovery in respect to the zodiacal light. To how much older a time than that of Muhammad, a knowledge of the light may be hereafter traced, is a question that I leave with confidence to those who so fruitfully investigate the fragmentary records of antiquity. I should imagine that no one will suppose Muhammad was the first to take notice of an appearance that is, at times, much brighter than the "milky way."

Another suggestion has also arisen in my mind, of a far wider interest, in connection with my discovery. It is this :—

Modern western Sanskrit scholars have inclined to the idea that the high plateau of Pamir, which separates Chinese from Independent Tartary, and the Indus from the Jaxartes, was the primeval cradle of the whole Aryan race. Physically and historically, this hypothesis seems to be utterly untenable, though my reasons would be out of place here. The zodiacal light would appear to confirm my objection.

From the latitude of Pamir, the zodiacal light is a very conspicuous object there, and sure to be noticed by a nation of shepherds, nomads, warriors, and commercial caravan travellers. Had the various Aryan races all come from Pamir, they would have brought thence a knowledge of the zodiacal light, as they all brought the word "yoke" with them from the land whence they radiated. How comes it, then, that in ancient times as in modern, no Aryan, not even after Alexander had nearly reached Pamir, and the Ptolemies had reigned in Egypt for centuries, ever observed or mentioned this phenomenon? My conjectural answer is this : The Aryan race came originally from a northern land, where the zodiacal light is rarely and but dimly visible, radiating from thence as they have done all through the historical period, and as their rearmost representatives, the Slavs, are persistently striving to radiate still to climes more favoured than their own.

J. W. REDHOUSE

London, November 5

The Caudal Disk

THE following may throw some light on the use of the caudal disk possessed by many of the *Uropeltidae* (*vide* NATURE, vol. xx. p. 538):—

When in the Wynaad, in September, 1875, I captured, at the foot of the Nilgiri Hills, a *Silybura*, referred, I think, by Col. Beddome to the species, *Nilgiriensis*. This snake I took down to Mangalore, and kept alive until the succeeding March, when it was unfortunately killed by ants. When caught it was working its way through grass by the road-side, and made violent efforts to escape, striking my hand repeatedly with the pointed terminal scales, by throwing back its tail. I am uncertain whether to view this action as defensive or not. It may have been the result of the snake's struggles, but it is noticeable that the movement was vertical and not horizontal.

I had but few opportunities of investigating the matter, for in a few days the snake became so used to being handled that it would make no efforts to escape.

It was kept in a box filled with earth to the depth of some six inches, and during day time never was to be seen, but at night came to the surface regularly, and was then much less sluggish than in the day. When taken out of the earth, it would at once

commence to bury itself by forcing its pointed snout downwards, and alternately expanding and contracting the thick anterior portion of the body. The motion was exactly that of a worm, and the posterior portion of the body and the tail were dragged slowly after by longitudinal contraction, and were not actively used. During the burrowing process there were occasional pauses of that part of the body above ground, but from the movements of the earth it was evident that the snake was still progressing. So sensitive was the skin that the gentlest breath would hasten the withdrawal of the body, but so soon as the caudal disk was level with the surface the snake would retain it in that position for a long time, sometimes half an hour and more. The numerous keels on the scales of the disk carried a certain amount of earth; the disk invariably remained in the same plane as the ground's surface, exactly filling the hole, and it was therefore almost impossible to detect the snake, without close examination.

These facts suggested to me the idea of the disk being protective, and I therefore, on numerous occasions, unearthed the snake and watched it burrow, always with the same result—the steady withdrawal of the sensitive portion of the body, and the retention of the disk at the surface for a longer or shorter period.

I do not know what are the chief enemies of *Uropeltidae*, but possibly certain carnivorous birds prey on them. If so, it is conceivable that the earth-covered disk would secure the snake and its hole from observation, until the head had worked sufficiently far underground to admit of the tail being at once withdrawn, beyond reach of beak or claw. This is quite possible from the power these snakes possess of extending themselves, a power well displayed if one of them be held firmly in both hands.

E. H. PRINGLE

P. and O. S.S. *Pekin*, Gibraltar, October

Intellect in Brutes

THE Duke of Argyll in his "Reign of Law" was, I think, the first who promulgated the dictum that man is the only tool-making animal. As far as I can ascertain, this assertion is admitted by developmentists, yet it is undoubtedly true that the Indian elephant makes two *implements*, or forms and alters certain things so as to adapt them specially to fulfil definite purposes, for which, unaltered, they would not be suitable.

One evening soon after my arrival in Eastern Asam, and while the five elephants were as usual being fed opposite the Bungalow, I observed a young and lately caught one step up to a bamboo-stake fence and quietly pull one of the stakes up. Placing it under foot, it broke a piece off with the trunk, and after lifting it to its mouth, threw it away. It repeated this twice or thrice, and then drew another stake and began again. Seeing that the bamboo was old and dry, I asked the reason of this, and was told to wait and see what it would do. At last it seemed to get a piece that suited, and holding it in the trunk firmly, and stepping the left fore-leg well forward, passed the piece of bamboo under the armpit, so to speak, and began to scratch with some force. My surprise reached its climax when I saw a large elephant leech fall on the ground, quite six inches long and thick as one's finger, and which, from its position, could not easily be detached without this scraper, or scratch, which was deliberately made by the elephant. I subsequently found that it was a common occurrence. Leech-scrapers are used by every elephant daily.

On another occasion, when travelling at a time of year when the large flies are so tormenting to an elephant, I noticed that the one I rode had no fan or wisp to beat them off with. The mahout, at my order, slackened pace and allowed her to go to the side of the road, where for some moments she moved along rummaging the smaller jungle on the bank; at last she came to a cluster of young shoots well branched, and after feeling among them, and selecting one, raised her trunk and neatly stripped down the stem, taking off all the lower branches and leaving a fine bunch on top. She deliberately cleaned it down several times, and then laying hold at the lower end broke off a beautiful fan or switch about five feet long, handle included. With this she kept the flies at bay as we went along, flapping them off on each side every now and then.

Say what we may, these are both really *bond fide* implements, each intelligently made for a definite purpose.

S. E. PEAL